JOINT TRAINING PROTO-FEDERATION (JTFp)

JTFp Status Briefing
for AMG-11
on
HLA TECHNICAL EVALUATION PROCESS
25 April 1996

OUTLINE

I. INTRODUCTION
II. CONCEPTS & TOOLS
III. ISSUES
IV. TESTING
V. EVALUATION RELATIONSHIPS
VI. NET ASSESSMENT
VII. CONCLUSION

BRIEFING OBJECTIVE

Describe JTFp's approach to the evaluation of HLA:

- **Relate ISSUES / TEST / EVALUATION**
- **Outline HLA evaluation PROCESS**
- **Indicate HLA evaluation STATUS**

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DEFINITIONS OF TERMS

ISSUES: A potential problem in HLA specification or implementation which has: 1) an HLA architecture cause, and its effects have HLA-wide importance; 2) federate importance; 3) conceivable solution; and 4) concrete, long-run risk.

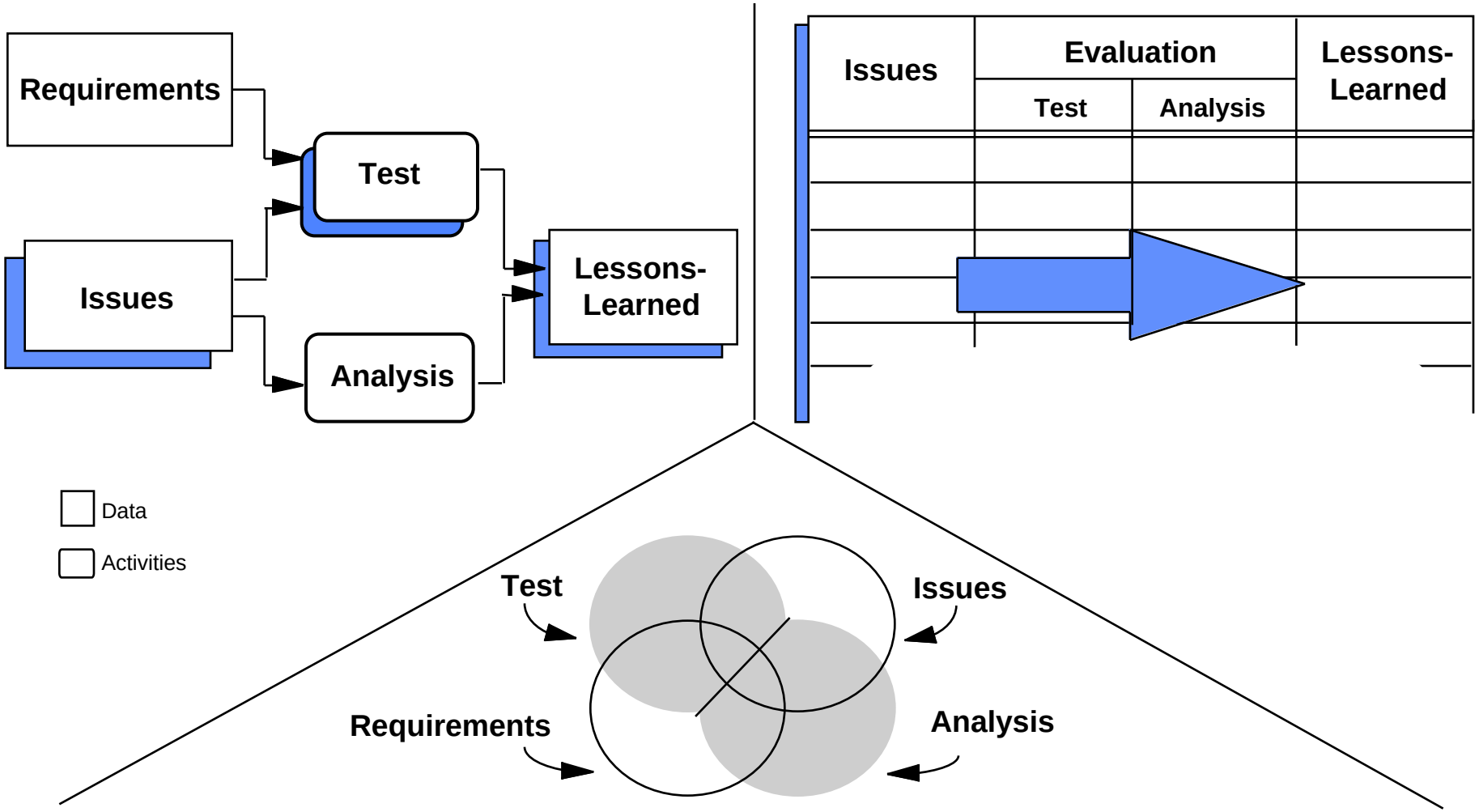
TESTS: Operations upon an entity, according to a pre-established procedure, yielding observed data suitable for evaluation, usually in context of pre-existing requirements or criteria.

ANALYSIS: Resolution or breaking up of anything complex into something simple for the purpose of understanding.

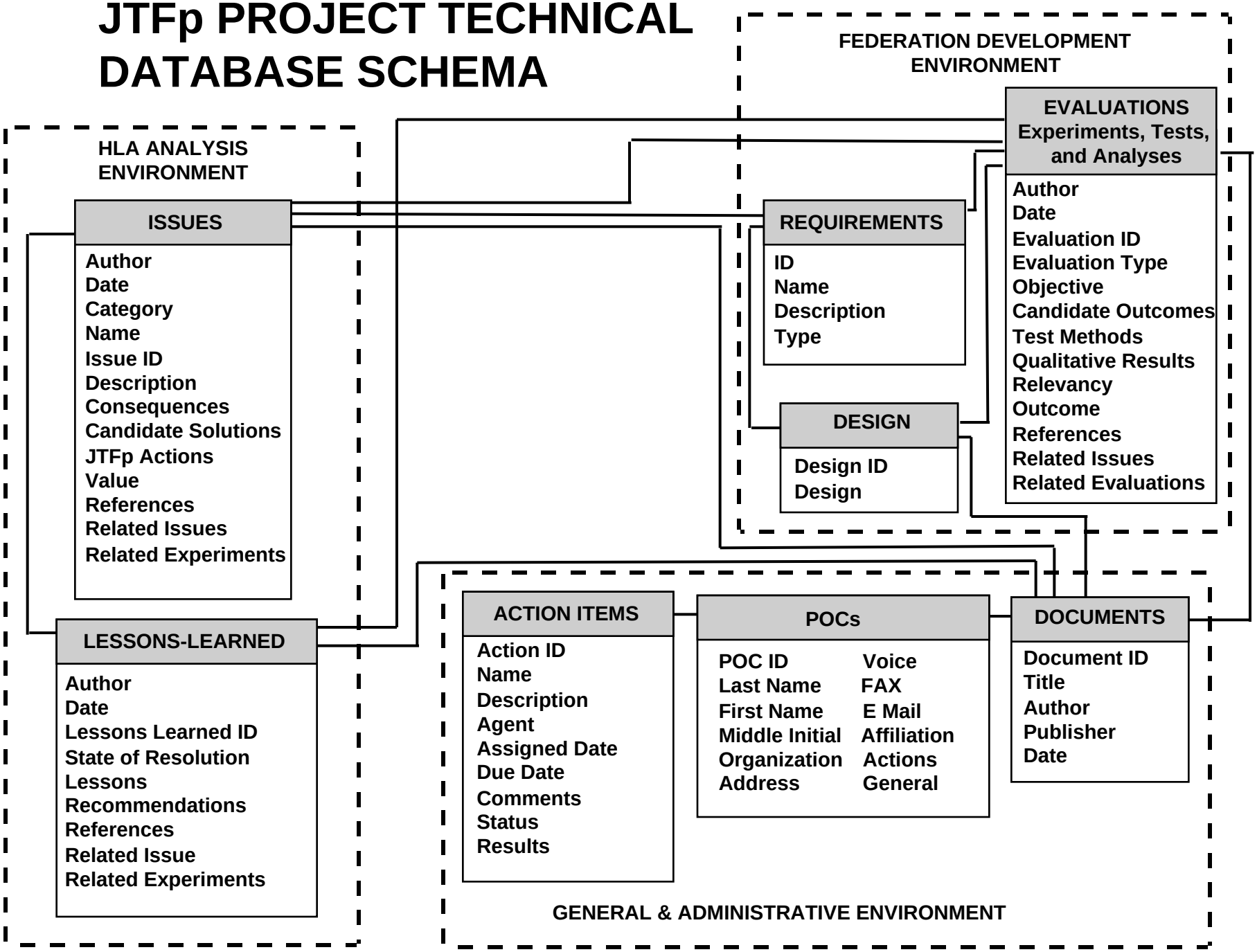
EVALUATION: Test + Analysis

LESSONS LEARNED: Determinations, findings, or conclusions based on the result of test or analysis (or both), on a given subject (e.g. frequently an issue).

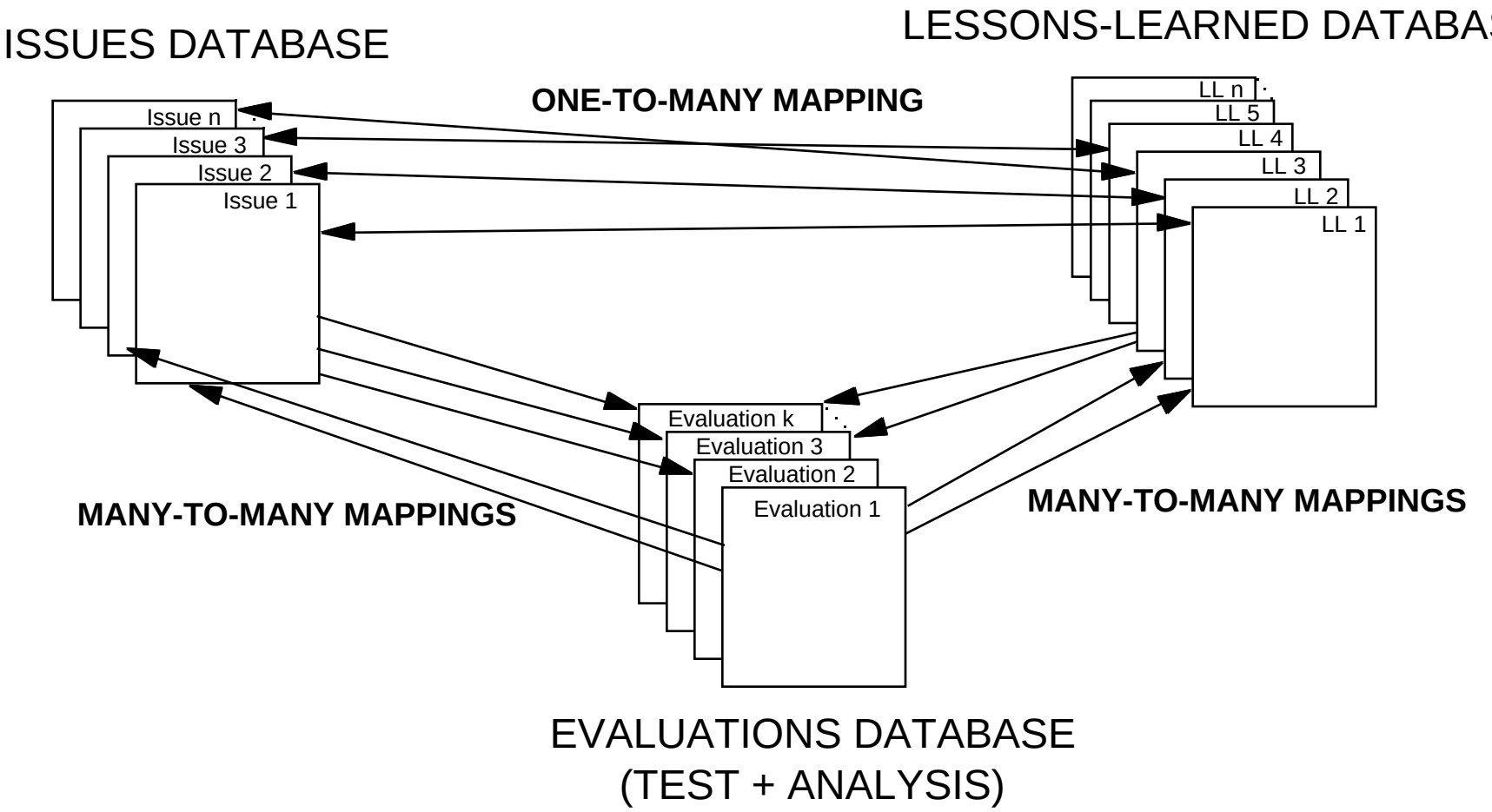
RELATIONSHIPS AMONG EVALUATION TERMS



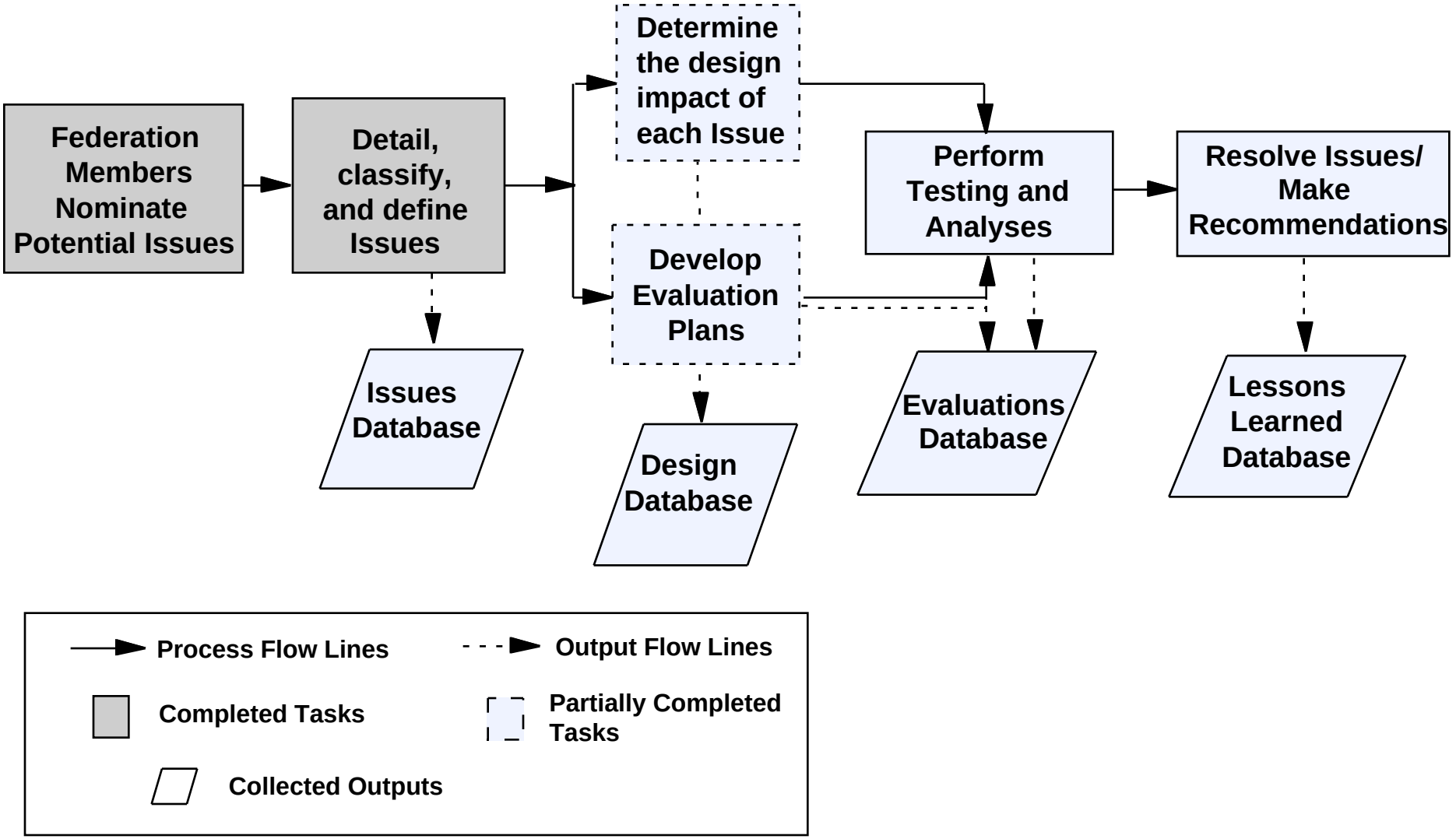
JTFp PROJECT TECHNICAL DATABASE SCHEMA



DATABASE RELATIONSHIPS



EVALUATION PROCESS MODEL



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ISSUES ANALYSIS STRATEGY

DEFINITION: Deliberately identify and classify candidate issues.

AUDIT: Preserve audit trail of issues, design impacts, evaluation, and lessons-learned.

DESIGN: Design protofederation system *and* evaluations to address and resolve Type I issues.

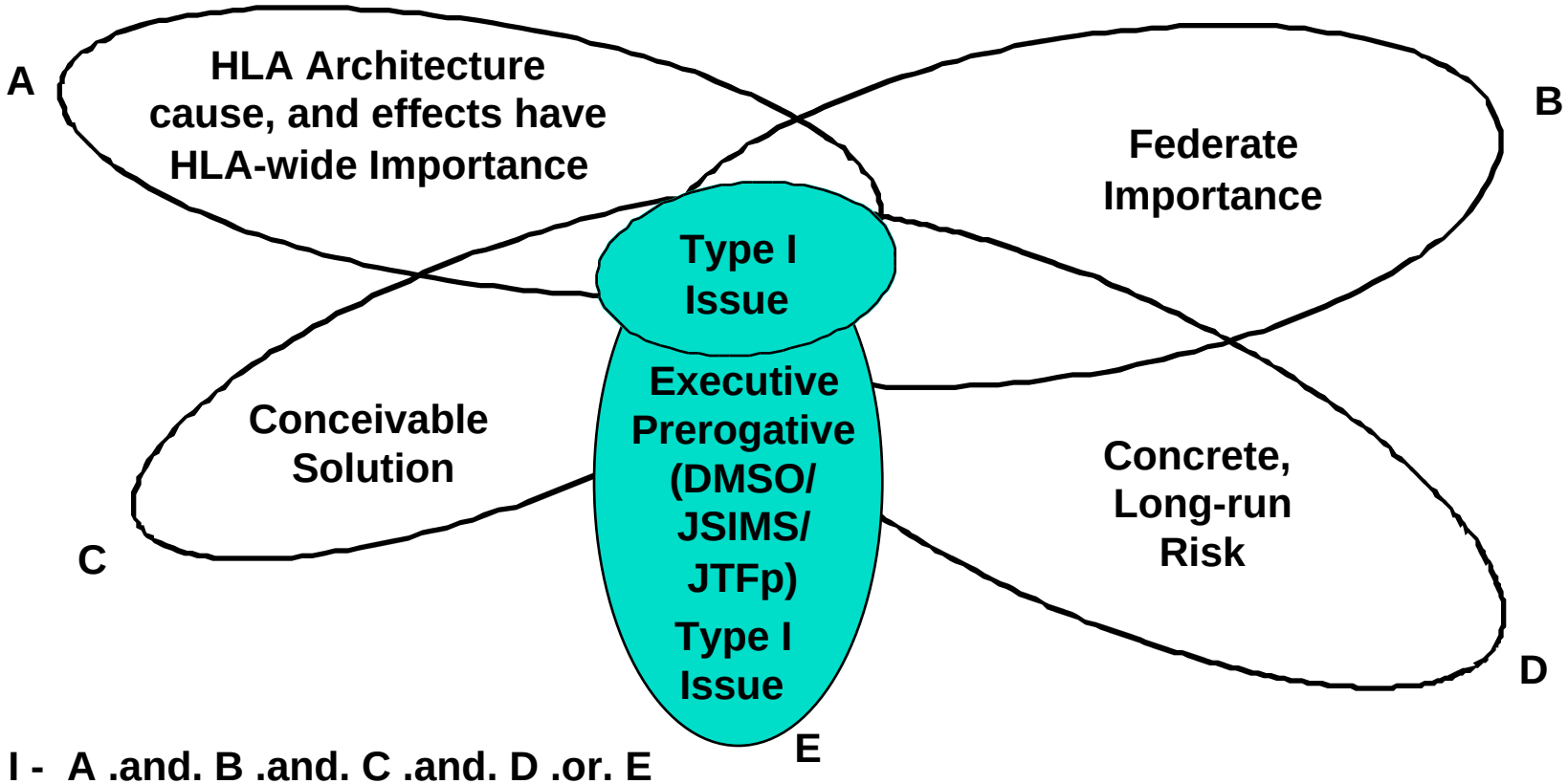
OBSERVATION: Collect available information that may support the resolution of Type II issues.

INFERENCE: Capture issues' resolutions in lessons-learned format.

NOTE: This strategy does not guarantee issue resolution as a final result; however, it promises deliberate investment of resources and recoupment of desired data products.

WHAT IS AN ISSUE?

...a potential problem in HLA specification or implementation which has the following characteristics:



Type I - A .and. B .and. C .and. D .or. E
Type II - (A .xor. B) .and. C .and. D .and. ~E
...else not an Issue

ISSUE SPECIFICATION EXAMPLE

Issue Name: Does the HLA / RTI have the ability to effectively and efficiently filter published attributes and interactions?

Category: Type I

Description: Message or event proliferation in high interaction rate federation is a major area of risk for the HLA...

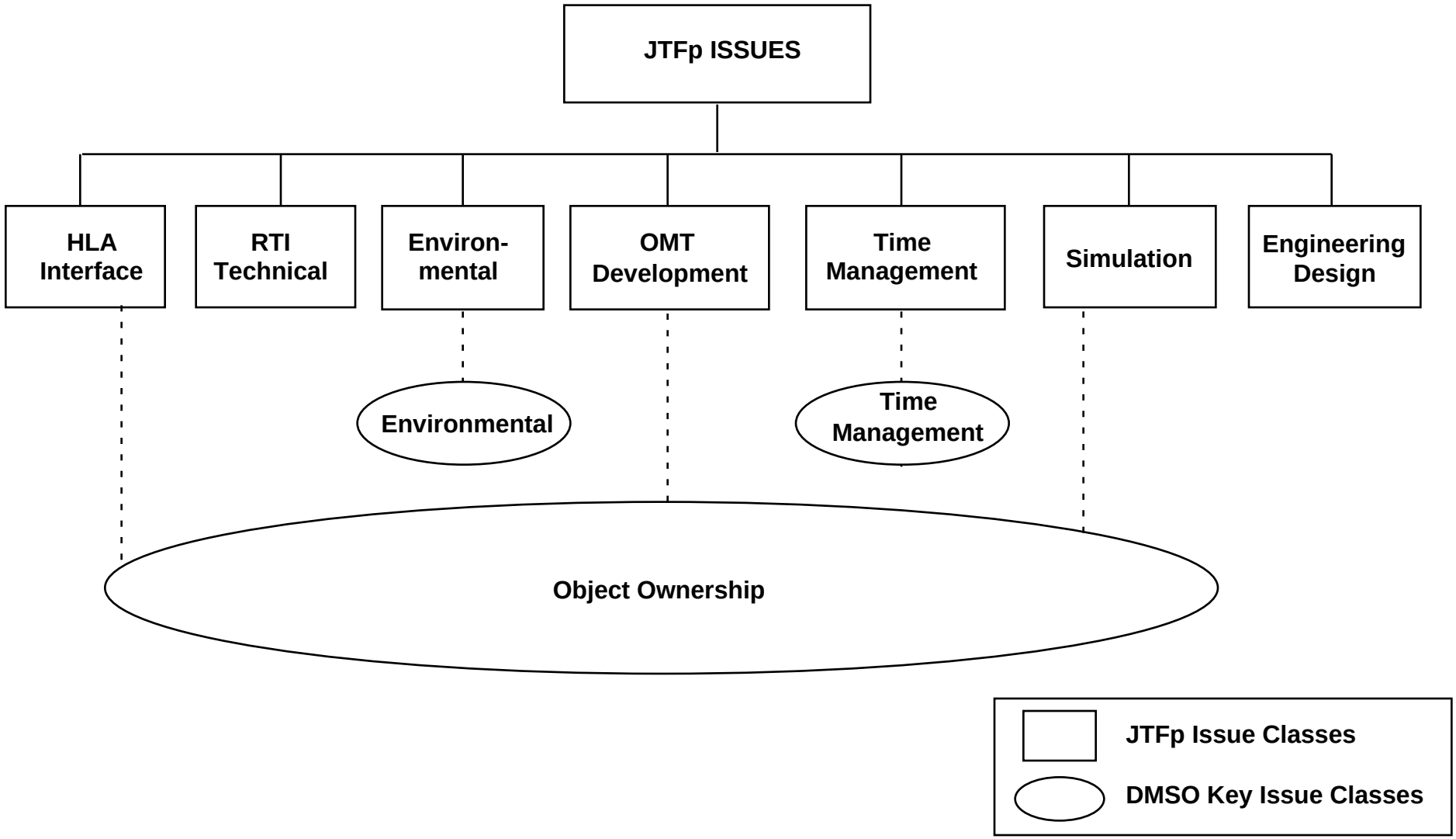
Consequences: Incorrect filtering affects correct results; insufficient filtering inhibits computational throughput.

Candidate Solutions/Actions: Explore / examine full range of filter types needed....

JTFp Actions: Derive lessons learned including assessment of message traffic loading with / without filtering...

Value: This is of fundamental value to assessing the future viability / utility of the HLA RTI for high interaction rate federations.

TOP LEVEL JTFp ISSUES TAXONOMY



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JTFp TESTING OBJECTIVES

JTFp DEVELOPMENT:

Support the development and integration of the JTFp

HLA EVALUATION:

Conduct characterization and evaluation exercises with the JTFp to evaluate facets ot HLA architecture specification and implementation in areas identified by:

- JTFp ISSUES, and
- TWG requirements

TYPES OF TESTING

- **FEDERATE PLATFORM INTEGRATION**
- **HLA COMPLIANCE**
- **JTFp INTEGRATION**
- **JTFp FUNCTIONAL PERFORMANCE**
- **JTFp COMPLEMENTARY ISSUE RESOLUTION**

FEDERATE PLATFORM INTEGRATION TESTING

SCOPE: Addresses the ability of a federate to be hosted and executed on the target platform in stand-alone mode.

PURPOSE: Verify that a federate can be integrated on the target platform.

Verify that a federate successfully performs simulation-peculiar initialization and does not ‘randomly return to the operating system’.

UUT: All federates, every revision.

CRITERIA: Federation initialization and control rules.

APPROACH: Manual installation and execution.

HLA COMPLIANCE TESTING

SCOPE: Address the ability of a federate to interact with the RTI using HLA services.

PURPOSE: Verify that simulations can exchange data via RTI per FOM specifications.

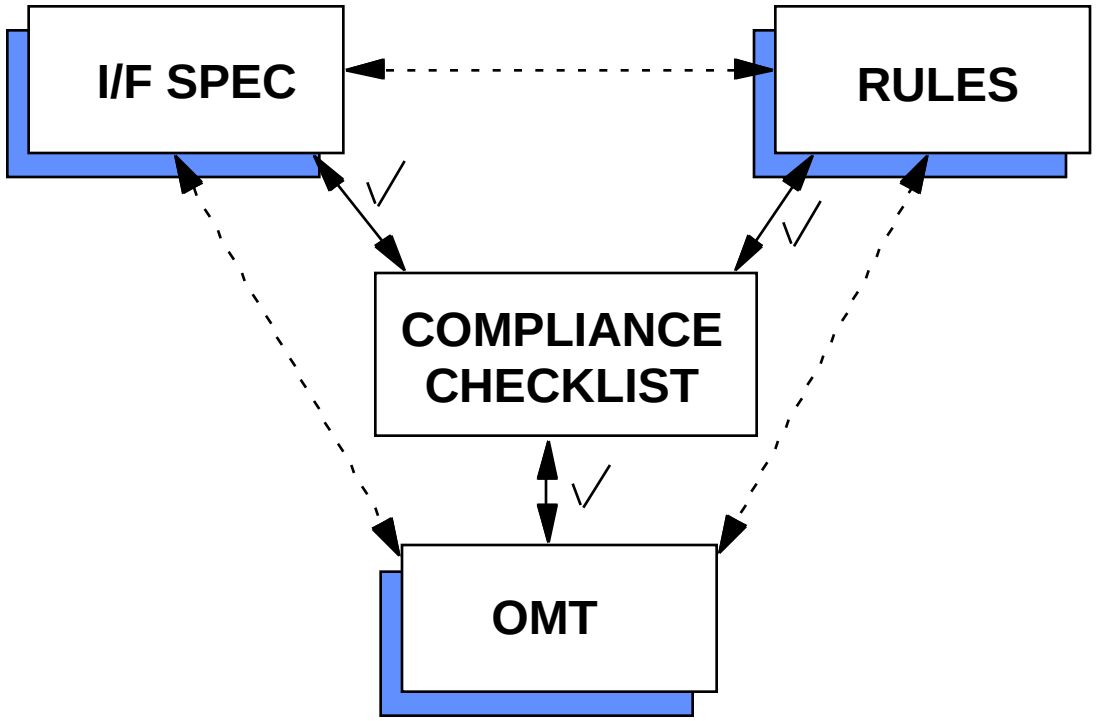
UUT: Ostensibly - All federates, every revision (emphasis on final revision, for fed's benefit).

Actually - a) HLA architecture, infrastructure, and b) compliance testing process / criteria.

CRITERIA: HLA Rules, I/F Spec., Compliance Checklist.

APPROACH: Single federate with RTI and test federate.

COMPLIANCE CHECKLIST RELATIONS TO HLA SPECS.



ASSUMPTION: I/F Spec + HLA rules + OMT + [?] are a complete and consistent specification of the HLA

NEED: Guide for independent evaluation of “HLA-ness”

HLA COMPLIANCE CHECKLIST CROSSWALK

	A	B	C	D
1	**Compliance CheckList Items**	**HLA Rules**	**IF Spec**	**OMT**
2	**FEDERATE Checklist Items**			
3	Compliance Item 1	Rule 6	N/A	Section 3.3
4	Compliance Item 2	Rule 7	*Full Support*	Sections 3.3, 4.5, 5.5.1
5	Compliance Item 3	Rule 8	(1) Incomplete	Section 5.5.1
6	Compliance Item 4	Rule 9	N/A	N/A
7	Compliance Item 5	Rule 10	Full Support	N/A
8	Compliance Item 6	Rule 4	Full Support	N/A
9	**FEDERATION Checklist Items**			
10	Compliance Item 1	Rule 1	N/A	Sections 3.2, 4.0
11	Compliance Item 2	Rule 2	N/A	N/A
12	Compliance Item 3	Rule 3	N/A	Section 5.4.1
13	Compliance Item 4	Rule 4	Full Support	Section 6.2
14	Compliance Item 5	Rule 5	Full Support	Section 5.5
15	**RTI Checklist Items**			
16	Compliance Item 1	Rule 4	Full Support	N/A
17	Compliance Item 2	(2) NO Match ?	Full Support	N/A
18	Compliance Item 3	Rule 2	N/A	N/A
19	Compliance Item 4	Rule 5	Full Support	N/A
20				
21	(1) The rule and the checklist need to include the following two requirements:			
22	1.1 The federate must deal with the situation in which a reflected object is deleted.			
23	1.2 The federate must be able to cancel reflection (unreflect) on any object it is capable of reflecting.			
24				
25	(2) There is no rule which seems to correspond directly to this checklist item. Could this be the same as rule 4?			
26	Also, where is the definition of the RTI's functional specification? How is it different from the Interface Specification?			

HLA COMPLIANCE CHECKLIST OBSERVATIONS

COMPLIANCE EVALUATION EMPHASIS:

- Judge compliance-evaluation process and tools *vs.* demonstration of compliance of JTFp or its federates

CHECKLIST CHARACTERISTICS:

- Rule-centric vs. I/F Specification-centric...OK
- Not operationally concrete
- Plausible start, good use of reference to specification

RECOMMENDATIONS:

- Extend checklist detail and evolve to an executable process
- Refine and preserve explicit mapping of Compliance Checklist to HLA system specification

JTFp INTEGRATION TESTING

SCOPE: Address the ability of new and legacy simulations to be integrated into a federation, exchange data according to FOM specifications, and meet the needs of the use in an HLA environment

PURPOSE: Interactivity testing verifies that objects can interact per FOM interaction table, and

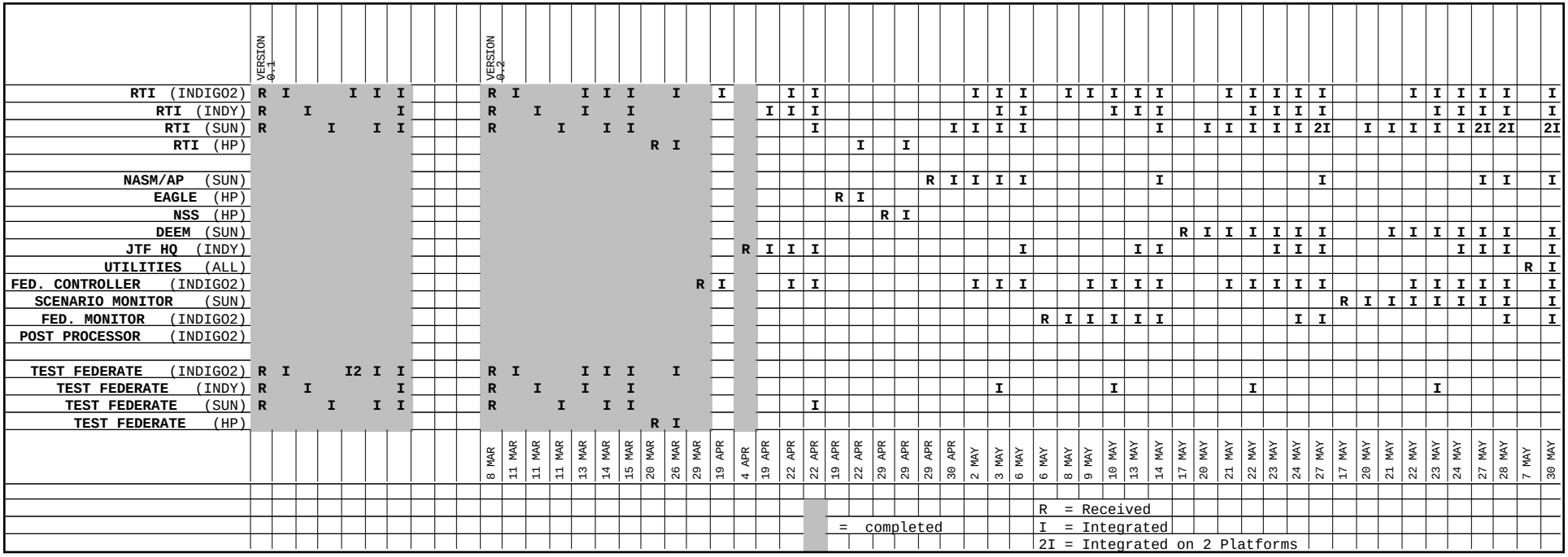
Functional testing verifies end-to-end functionality of integrated simulations in a federation.

UUT: JTFp subsystems / system, HLA

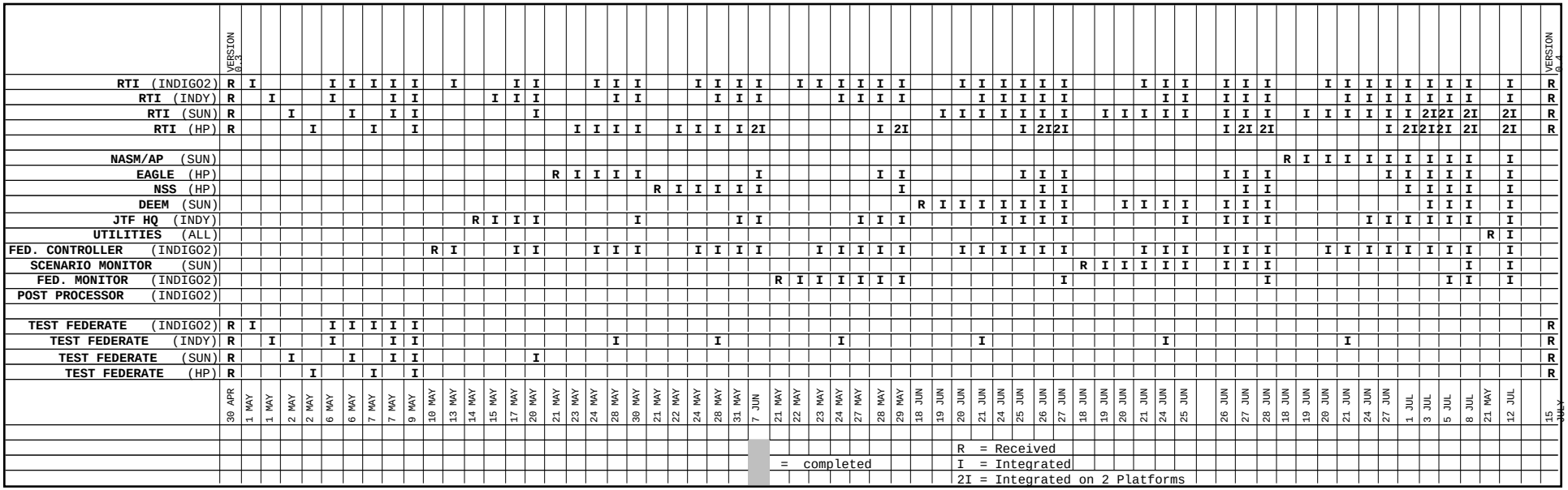
CRITERIA: FOM

APPROACH: Progressive Integration

PROGRESSIVE INTEGRATION SCHEDULE



PROGRESSIVE INTEGRATION SCHEDULE



JTFp FUNCTIONAL PERFORMANCE TESTING

SCOPE: Investigate issues related to real-time infrastructures; time management; multi-platform integration; distributed objects; resource utilization; and message interaction strategies.

PURPOSE: Resource Utilization test: record and investigate memory, cpu, and network usage;

Latency test: record and investigate time differences for all object message traffic;

Scenario test: verify federation's ability to perform pre-planned interactions and missions according to a scenario and support associated 'free-play'; and

JTFp FUNCTIONAL PERFORMANCE TESTING

PURPOSE: Performance Optimization test: record system performance during loading and establish federation performance boundaries
cont.

UUT: JTFp system, HLA

CRITERIA: HLA / Federate needs, measures form TWG / DMSO

APPROACH: Fully-populated, distributed, integrated-system trials with excursions

COMPLEMENTARY ISSUE RESOLUTION TESTING

SCOPE: Address JTFp ISSUES unresolved by other testing and analysis.

PURPOSE: Provide evidence directly relevant to issues for which other tests have provided no significant results.

UUT: JTFp subsystems / system, HLA

CRITERIA: ...TBD from ISSUES on case-by-case basis

APPROACH: Tailored evaluation procedures (see evaluation exercises in JTFp technical relational database)

TESTING DOCUMENTATION

PLAN:

- Single comprehensive Test Plan

DESCRIPTION:

- Standard test descriptions

PROCEDURE:

- Standard test procedures

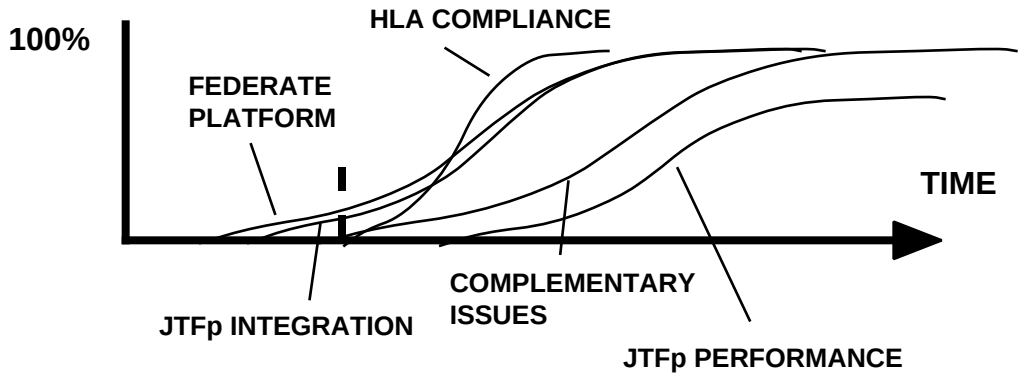
REPORT:

- Standard test reports
- Lessons-learned results
- Integrated Final Report

TESTING STATUS

TEST TYPE	CONCEPT	DESCR.	PROC.	EXE.	RPT.
FEDERATE PLATFORM	●	◕	◕	◕	○
HLA COMPLIANCE	◔	○	○	○	○
JTFp INTEGRATION	●	◕	◕	◕	○
JTFp PERFORMANCE	◔	◕	○	○	○
COMPL. ISSUES	◑	◕	○	○	○

Notional indication of expected progress by test-type



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LESSONS-LEARNED RESULTS STATUS

FEDERATION SYSTEMS ENGINEERING:

- FOM / HLA Development process...is time consuming and difficult, but not busted. Automation should help.
- Significance of scenario 'views' conspicuous
- 'Appetite' for semantic information on interactions and attributes in federation specification
- Distributed developer / integrator roles for federation life-cycle support work OK

HLA DESIGN:

- C.M. / 'versioning' / hardware-software dependencies are more significant than anticipated (and will continue to be...)
- RTI documentation is crucial

PROJECTED EVALUATION RESULTS AVAILABILITY

ISSUES	JUNE	JULY	AUGUST +
HLA INTERFACE			
RTI TECHNICAL FEASIBILITY			
ENVIRONMENTAL			
OMT DEVELOPMENT			
TIME MANAGEMENT			
SIMULATION			
ENGINEERING DESIGN			
OBJECT OWNERSHIP			

ANTICIPATED JTFp RESIDUAL ISSUES

...issues which may not be completely resolved in JTFp...

HLA INTERFACE:	C4ISR I/F and surrogates
RTI TECH. FEAS.:	RTI-driven cost / benefit, RTI data filter capability / constraints
ENVIRONMENTAL:	NA
OMT DEVEL.:	NA
TIME MGMT.:	Testing of a wide variety of time-management services and conditions
SIMULATION:	Fair-fight, scalability, plug-and-play with virtual/HWIL/MIL, causality, etc..
FED. ENG. DESIGN:	NA

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CONCLUSION

- JTFp has an algorithmic process for proceeding through Proto-federation test and analytical evaluation
- JTFp will execute as described
- JTFp will deliver technical products as indicated